Enabling Data-Driven Optimization of Quality of Experience for Internet Applications

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Abstract

Today’s Internet has become an eyeball economy dominated by applications such as video streaming and VoIP. With most applications relying on user engagement to generate revenues, maintaining high user-perceived QoE (Quality of Experience) has become crucial to ensure high user engagement. For instance, one short buffering interruption leads to 39% less time spent watching videos and causes significant revenue losses for ad-based video sites. Despite increasing expectations for high QoE, existing approaches have limitations to achieve the QoE needed by today’s applications. They either require costly re-architecting of the network core, or use suboptimal endpoint-based protocols to react to the dynamic Internet performance based on limited knowledge of the network.

In this talk, I will present a new approach, which is inspired by the recent success of data-driven approaches in many fields of computing. I will demonstrate that data-driven techniques can improve Internet QoE by utilizing a centralized real-time view of performance across millions of endpoints (clients). I will focus on two fundamental challenges unique to applying data-driven approaches in networking: the need for expressive models to capture complex factors affecting QoE, and the need for scalable platforms to make real-time decisions with fresh data from geo-distributed clients. Our solutions address these challenges in practice by integrating several domain-specific insights in networked applications with machine learning algorithms and systems, and achieve better QoE than using many standard machine learning solutions. I will present end-to-end systems that yield substantial QoE improvement and higher user engagement for video streaming and VoIP. Two of my projects, CFA and VIA, have been used in industry by Conviva and Skype, companies that specialize in QoE optimization for video streaming and VoIP, respectively.
Bio

Junchen Jiang is a PhD candidate at Carnegie Mellon University, advised by Prof. Vyas Sekar and Prof. Hui Zhang. His research interests are networking and systems. His research applies ML and data science in networked systems research, and his thesis demonstrated that such data-driven approach could improve the quality of many popular Internet applications. Many paper resulting from his research have been published in top venues, including ACM SIGCOMM and USENIX NSDI. Junchen received his bachelor’s degree in computer science from Tsinghua University, China, in 2011. He received Juniper Networks Fellowship, and has won a paper award from ACM CoNEXT 2012.

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